In the Claims

1. (AMENDED) A spin-valve type magnetoresistive sensor comprising, on a substrate, an antiferromagnetic layer; a pinned magnetic layer formed in contact with said antiferromagnetic layer and having a magnetization direction made stationary under an exchange anisotropic magnetic field generated by interaction with said antiferromagnetic layer; a non-magnetic electrically conductive layer formed between a free magnetic layer and said pinned magnetic layer; soft magnetic layers arranged on said free magnetic layer [while] having a spacing corresponding to a track width [is left] between said soft magnetic layers; bias layers formed on said soft magnetic layers and [acting] to uniformly arrange a magnetization direction of said free magnetic layer in a direction crossing the magnetization direction of said pinned magnetic layer; and electrically conductive layers [for applying] to apply a detection electric current to said free magnetic layer,

said antiferromagnetic layer and said bias layer [being] each [made of] comprising an alloy containing at least one [or more elements] element selected from among Pt, Pd, Rh, Ru, Ir, Os, Au, Ag, Cr, Ni, Ne, Ar, Xe and Kr, as well as Mn.

2. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein at [lease] least one of said pinned magnetic layer and said free magnetic layer is divided into two layers with a non-magnetic intermediate layer interposed between the two layers, and the divided two layers are held in a ferrimagnetic state [where these] in which the divided two layers are magnetized in directions 180° different from each other.

3. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said antiferromagnetic layer [is made of] comprises an alloy having the following composition formula;

X_mMn_{100-m}

where X is at least one [or more elements] element selected from among Pt, Pd, Rh, Ru, Ir and Os, and a composition ratio *m* satisfies 48 atom % ≤ m ≤ 60 atom %.

4. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said bias layer [is made of] comprises an alloy having the following composition formula;

X_mMn_{100-m}

where X is at least one [or more elements] element selected from among Pt, Pd, Rh, Ru, Ir and Os, and a composition ratio *m* satisfies 48 atom % ≤ m ≤ 60 atom %.

5. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said antiferromagnetic layer [is made of] comprises an alloy having the following composition formula;

$Pt_mMn_{100-m-n}D_n$

where D is at least one [or more elements] element selected from among Pd, Rh, Ru, Ir and Os, and composition ratios *m, n* satisfy 48 atom % ≤ m + n ≤ 60 atom % and 0.2 atom % ≤ n ≤ 40 atom %.

6. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said bias layer [is made of] comprises an alloy having the following composition formula;

$Pt_mMn_{100-m-n}D_n$

where D is at least one [or more elements] element selected from among Pd, Rh, Ru, Ir and Os, and composition ratios *m, n* satisfy 52 atom % ≤ m + n ≤ 60 atom % and 0.2 atom % ≤ n ≤ 40 atom %.

7. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said soft magnetic layer [is made of] comprises a NiFe alloy.

8. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein recesses are formed in said free magnetic layer on both sides of an area corresponding to [a] the track width, said soft magnetic layers are formed to fill said recesses and are directly joined to said free magnetic layer through bottom surfaces of said recesses, and said bias layers and said electrically conductive layers are successively formed on said soft magnetic layers.

9. (AMENDED) A spin-valve type magnetoresistive sensor according to Claim 1, wherein said free magnetic layer is divided into [two layers with] a first free magnetic layer disposed farther away from the pinned magnetic layer and a second free magnetic layer disposed closer to the pinned magnetic layer, a non-magnetic intermediate layer is interposed between the [two layers, and wherein, assuming that one free magnetic layer farther away from said pinned magnetic layer is a first free magnetic layer and the other free magnetic layer closer to said pinned magnetic layer is a second free magnetic layer,] first free magnetic layer and the second free magnetic layer, a magnetic film thickness of said first free magnetic layer is smaller than a magnetic film thickness of said second free magnetic layer.

10. (AMENDED) A method of manufacturing a spin-valve type magnetoresistive sensor comprising [the steps of]:

forming an antiferromagnetic layer, a pinned magnetic layer, a non-magnetic electrically conductive layer, and a free magnetic layer successively on a substrate, thereby forming a first laminate;

heat-treating said first laminate at a first heat treatment temperature while applying a first magnetic field in a direction perpendicular to a direction of a track width, thereby generating an exchange anisotropic magnetic field in said antiferromagnetic layer to make magnetization of said pinned magnetic layer stationary;

forming soft magnetic layers on said first laminate while a spacing corresponding to the track width is left between said soft magnetic layers, forming bias layers on said soft magnetic layers, and forming electrically conductive layers on said bias layers [for applying] to apply a detection electric current to said free magnetic layer, thereby forming a second laminate; and

heat-treating said second laminate at a second heat treatment temperature while applying a second magnetic field smaller than the exchange anisotropic magnetic field of said antiferromagnetic layer in [a] the direction of the track width, thereby imparting a bias magnetic field to said free magnetic layer in a direction crossing a magnetization direction of said pinned magnetic layer.

Respectfully submitted,

Gustavo Siller, Jr.
Registration No. 32,305
Attorney for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200